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① • Descriptive studies :-

• **Nature**: done on a new dis. to characteriz it, quantify its frequency, determine how it varies in relation to individual, place & time.
- asked: what, where, when, who, why & How?

• **Uses**: 1- provide photo for magnitude of disease.
2- provide Close to etiology.
3- provide background for planning, organization & evaluation of preventive measures.
4- Contribute to research.

• **Types**:

① Case report	② Case Series	③ Based on rates
• Sequence of events that may suggest previously unsuspected causal relationships. • Can happen once	• Identify common features among multiple cases & describe pattern of variability among them. • Can happen repeatdly.	• Quantify the burden of dis. • Using data from existing Sources as birth & death certificates. • rich Source of hypothesis.

• Analytical Studies:-

* Hypothesis → testing for analysis → identify relationship between exposure & outcome.
* Used to refer to any trait, behaviour or environmental factor. ②

① Case Control Study	Cohort Study
- from effect to cause - Start with disease.	- from cause to effect - Start with people exposed to risk factors.
- Tests if the suspected factors associated more with diseased.	- Tests if disease occur more in those who exposed to risk factors
- First approach to testing hypothesis.	- Reserved for precisely formulated hypothesis
- fewer no. of subjects	- large no.
- Suitable to rare dis.	- inappropriate when exposure is rare.
- estimate odds ratio	- Yields IR, RR, AR.
- Relative Inexpensive	- expensive ②

	Case Control	Cohort
* Advantages:	1- Excellent way to study rare dis. 2- Relatively quick 3- " Inexpensive 4- " require few study subjects. 5- use existing records. 6- study many possible causes of disease.	1- Better for studying rare exposure 2- Complete data on cases, stages. 3- Study more than one effect of exposure. 4- Calculate & compare rates in exposed & non. 5- Choice of factors available to study 6- quality control of data
* Disadvantages:	1- Relies on recall or existing records about exposure. 2- Difficult or impossible to validate data. 3- Control of extraneous factors incomplete 4- Can't calculate rates 5. Can't study mechanism of disease.	1- Need to study large number. 2- May take many years. 3- Circumstances may change during study. 4- Expensive 5- Rarely possible to study mechanism of dis. 6- Control of extraneous factors may be incomplete

* Cohort Studies:
  - Prospective Cohort study
    - begin with 2 groups: one exposed to Cause & other is Control.
    - followed over time & record the change in status.
  - Retrospective Cohort study
    - start when all cases identified
    - Evaluate history of each study for evidence of exposure.

③ • Application of Epi. investigation to prevent & Control dis.

1. Levels of Disease Prevention:

[1] Primary prevention:
- healthy people
- Promotion of health & prevent exposure to diseases.

[2] Secondary prevention:
- Sick Individuals
- Stop or slow progression of dis.
- early detection & TT

[3] Tertiary preventio
- people with chroni disease
- prevent further disability or death to limit impacts

2. Disease Control strategies:

1- Exclusion / Prevention "keep it out of here"
2. Control: keep it in an acceptable level.
3. Eradication: get rid of it.

3. Elements of epidemic dis. Control:

① Control the Source of pathogen "Remove the pathogen".
② Interrupting the transmission sterilize environmental Source of spread, vector Control.
③ C-trolling or modifying the host response to exposure: immunize the Susceptible, use prophylactic chemotherapy.

• Determinants :- (Causes of dis. occurance)

⇒ **Def.** any factor or variable that can affect directly or indirectly frequency of disease occurance in a population.

⇒ **Classification:**

① Primary & Secondary determinants: ④

ⓐ Primary (Specific factors):

↳ Intrinsic : Causal agent is an integral part of the host. (Hereditary, Metabolic & hormonal disturbance, Behavioral disorders)

↳ Extrinsic : Causal agent isn't integral part of host. (Non living agent, Chemical agent, Living agent).

ⓑ Secondary (Predisposing factors):

↳ Intrinsic : Causal agent is an integral part of host. (Age, Sex, spp., breed & strain, metabolism & hormonal balance, state of nutrition, stress, physiological state, Vaccination).

↳ Extrinsic : factors in the environment. (Stocking density, ventillation, env. conditions : temp., humidity, wind velocity ...).

② Epidemiological triad (Epi. triangle or determinants related to epi. triad) :-



ⓐ agent :- Biological, physical or chemical factors whose presence or absence or relative amount (too much or too little) are necessary for dis. occurance.

• Types < living / Non-living

** Agent Factors :-

(1) Infectivity : Capacity of an agent to produce dis. • measured by 2ndry attack rate.

↳ Primary infection: first dis. noted in an illness.
↳ Secondary " : body weak by primary infection, there are many predisposing factors to 2nd infection with same organism.
↳ Mixed Infection: disease caused by 2 or more organism.

(2) Pathogenicity : • Capacity of agent to cause disease in infected host. • measured by proportion of individuals with clinically apparent disease.

(3) Virulence : refers to severity of disease, measured by proportion of severe or fatal cases.
• If fatal → use case fatality rate.

ⓑ Host :- an animal which permits lodgment of an infectious dis. agent under normal conditions.

(I) Intrinsic : (1) Spp. : C.a may be specific or multipart spp.

(2) Breed : response to agent differ among breed and races within a given spp. (3) Sex (4) Age
(5) Physiological state.

(II) Extrinsic : Animal use (occupation for man), A performance & Managment.

© **Environment :-** The domains external to the host in which the agent may exist, survive or originate.

- Consists of physical, biologic, social & economic components that affect survival of agent (temp., water, food ....)

(I) Climate.

(1) Macroclimate (weather): Temp., Radiation, Humidity, wind speed....
↳ ex. droplet nuclei (few microns) from infected A can be transported for long distance (50 km or more) favored by rainfall

(2) Microclimate : at the ground or soil surf. where soil is the suitable ecosystem for survival of fungi, ticks...
↳ ex. Nematode larva

(II) Biological Environment:

(1) Man : Vets, Sales men, Visitors.....
↳ ex. Fowl Plague can be introduced into poultry population by careless laboratory workers.

(2) Wild A's & birds : ex. AI

(3) Micro-organisms, domestic A's & Insects.

• **Causation :-** (def. & theories)

* Is an event, condition or characteristic which plays an essential role in producing an occurance of the agent has to be present in every case of the disease.

* ① In late 19th Century, Koch's postulates brought a degree of order & discipline to the study of infectious diseases, although the key assumption of "one-agent one-disease" was highly restrictive (since it failed to take account of diseases with multiple etiologic factors, multiple effects of single causes, carrier states & non-agent factors such as age & breed).

② Based on John Stuart Mill's rules of inductive reasoning from 1856, Evan developed a Unified Concept of Causation includes the following criteria:

1- proportion of individuals with disease should be higher in those exposed to putative cause السبب المفترض than in those not exposed.
2. Exposure to putative cause should be more common in cases than in those without the dis.
3- Number of new cases should be higher in exposed than non
4- Disease should follow exposure to putative cause.
5. Should be a measurable biologic spectrum of host responses.
6- The disease should be reproducible experimentally.
7- preventing or modifying the host response should ↓ or eliminate the expression of disease.

⇒ Theories of disease causality :-

(1) 19th Century theories
- → Contagion theory
- → Supernatural "
- → Personal behaviour theory
- → Miasma theory.

(2) 20th Century theories
- ↳ Germ theory
- ↳ lifestyle
- ↳ Environmental
- ↳ Multi-causal

Disease in population

- population: Complete Collection of individuals that have Some particular characteristics in Common. It Could be of known size or unknown.
  - from epidemiological point, it is an advantage to know the size.

- population at Risk = enumerated events / population in which events took place

- Herd Immunity: resistance of group to invasion & Spread of an infectious agent, based on immunity of high proportions of individuals in the Community.

  - Conditions under which herd immunity best functions:
    1. Single reservoir
    2. Direct transmission
    3. Total immunity
    4. No Carrier state
    5. uniform distribution of immunes
    6. No over Crowding.

Disease Occurance

(I_ Pattern of disease occurance) ⑦

① **Sporadic**:- occasional Cases occuring at irregular intervals, occur sporadically.

- Causes:-
  1. Existance of infection and only Some Ai show signs of dis.
  2. Infection is absent & disease noticed when infected A' is introduced.
  3. Infection is maintained in another spp. of Ai, interspecies Transmission

② **Endemic**: Persistent occurance with a low to moderate level.

- Represent → clustering of dis. events in space but not in time. (native to defined area or place).
- Concerned with both clinical & subclinical in infectious & non-infectious.

→ Holo-endemic: most Ai affected.
→ Hyper-endemic: high proportion of A' population affected.
→ Meso-endemic: moderate " " " " "
→ Hypo-endemic: Small proportion of Ai affected.

③ **Epidemic / outbreak**: occur in a given population during given time interval in excess of its normally expected frequency of occurance.

→ Point epidemic: Ai exposed to common source of infection (e.g: Contamination of water, food, air, fomites)
→ Propagating epidemic: primary Cases secrete the infectious agent & the number affected increase gradually over time.

④ **Pandemic**: epidemic spread over several Countries affecting large number of people (e.g: AI, Swine flu, FMD...)

(1) Measures for Combating of Contagious diseases:-

1. Identification & Isolation
2. ℿ of affected Às
3. Slaughter Às with incurable dis.
4. Disposal of dead Às
5. Destroy Contaminant folder
6. proper disposal of Contaminated water.
7. Regular disinfection
8. Restrict movement
9. Close Â markets.
10. Regular spray of Insecticides.
11. Regular deworming
12. Avoid stress
13. Adequate ventillation.

Quarantine:- ℿ

* Def. restrict movement of well Às exposed to risk of infection for a period of time not longer than I.P of dis.
* Aims: 1. give time to Contagious dis. in latent phase to become active.
  2. limit the introduction & spread of dis.
* Classification (acc. to location):
  1. International: at the ports bet. borders of Countries.
  2. Interprovincial: between states, provinces & governorates.
  3. Local: inside the province or governorate.

(9) (I) Measures taken for Imported Às:

* Generally, they must have the official health Certificate which Contain:
  1. Stamped by the governmental stamp.
  2. Contain the name & address of Sender & reciever
  3. Results of required test with dates & vaccines.

(1) Cattle (for Breeding Purposes):

1. Country of origin must be free from plague & CBPP.

2- Area from A's derived → free from FMD & Cattle plague for at least 6 m. prior exportation & the imported vaccinated against FMD strains A&C.

3- A's tested within 15 d. prior exportation for T.B, Brucella, Trichomoniasis.

② Cattle (for slaughtering) "Calves":

1- accompanied by Veterinary Sanitary Certificate (VSC).

2- Castrated, not more than 2Y. old

3- Transported from country without stopping.

4- examined clinically on ship at arrival.

5- kept in quarantine till slaughter.

③ Sheep & goats (for breeding):

1- Free from (Cattle plague, CBPP, Anthrax & FMD) within 6 m. before exportation.

2- Tested within 30 d. before export against brucellosis.

3- Vaccinated against FMD (A&C).

4- Herd free from Vibriosis, Trichomniasis, blue tongue, John's, Coccidiosis, psudo-T.B, liver flukes.

④ Equines:

1- VSC.

2- Countries free from glanders, Strangles, Equine plague, Equine encephalomyelitis within 60 d. prior exportation.

3- Malline test → -ve.

4- Vaccinated against Equine plague (not less 21 d & not more 6 m.) before exportation or vaccinated & isolated at arrival.

5- A's in quarantine for 21 d.

⑤ Poultry:

1- Flocks free from pullorum dis, fowl plague, ND, leukosis, fowl cholera. fowl pox (60d

2- Country must be free from Infectious & Contagious diseases.

⑩ Prevention strategies for tick infestation in farm A's.

⇓

• **Control** :-

ⓐ On pasture:

1- Direct way: taking A's away from infested pasture, females on the ground will die.

2- Indirect method (Rotational grazing): pasture divided into 2 parts (A&B), allowing A's to one division then treat A's by spraying, dipping at 10 d. interval.

ⓑ On Stable:

1- Removal of wastes.
2- Cleaning & disinfestation.
3- Special attention to cracks or fissures.

ⓒ On the animal:

(1) Short term remediation: directed against parasitic stages of ticks.
- → Chemical Control for all stages of tick life cycle (nymph, larva, adult)
- → dipping or pour-on (direct application of pesticides)
- → Leave some remidant of insecticide on the body of A.

(2) Long term reduction of tick population.

** If the used insecticide become resistant, you should do:
1- Frequent application of insecticides.
2- Change the type of insecticides.
3- Depopulation
4- Using of alternative methods of tick Control as neem plant & entomopathogenic fungi.

→ Pasture burning (all stages of ticks dead).

• Biosecurity major (11) Components (RITs):

[1] Resistance (R) : It means building up or enhancing herd immunity through:

1- Vaccination protocol with well-trained person & Suitable vaccine.
2- Adequate nutrition, minimize stress.
3- purchase A` of known status.
4- On site testing / Surveillance.

[2] Isolation (I) : Time between in-out or distance between farms or houses in a farm & physical barriers (fences, showers, footbaths):

(1) Distance between farms:
- 1.6 km bet. farm & other.
- 20 m. bet. houses inside the farm.
- One km. for hatcheries, 2 km for layer & parent farms.

(2) Time between "in-out" & refilling of poultry house is 2 wks.

(3) Physical barriers:
1- Using gates, lock on doors, no entry signs.
2- Restrict no. of visitors.
3- Visitors must wear clean coverall & boots.
4- washing hands before & after working.
5- Shower in & Shower out.
6- Trucks wheels pass on Sanitizing bath.

[3] Traffic Control (T) : all movement into or in the farm:

1- Restricting human, equipment, A` movement onto the farm & movement patterns within the farm.
2- Using signs to restrict human movement.
3- Fencing help in Control of people.
4- Limit of A`s as dogs, cats & rodents.
5- Screens on windows.

[4] Sanitation (s) : Cleaning & disinfection of A` housing, people, materials, equipment entering the operation.

1. Proper ventillation.
2. proper stocking density.
3. proper disposal of manure & dead carcass.
4. Control of Rodents & Insects.
5. prevent using of permenant pasture.
6. Using of Suitable Sanitizer.
7. prevent Contamination of food & water.
8. Good lighting program.
9. Isolation of diseased A`.

(12) Cow Cubicles Biosecurity:

1- Building should thoroughly cleaned.
2- Surfaces → pressure washed by Sanitizer.
3- Cleaned suf. → sprayed with disinfectant
4- At least once daily, remove dung and renew bedding.
5- Clean, disinfect all equipment, utensils....

(13) • Reconstruction of poultry farms to fulfill biosecurity :-

[1] Conceptual Biosecurity:

1. primary level of disease prevention.
2. Involve Site, planning, distance of region, public roads, location of facilities.
3. Impossible to change.

[2] Structural Biosecurity:

1- Design of farm.
2- Buildings inside the farm (feeding System, water Storage, drainage system ....)
3- Difficult to be Changed (expensive).

[3] Operational Biosecurity:

1- Managment steps.
2- Includes 2 routiens (clean & disinfection), Control of visitors, Source of Stock.
3. Can be modified at low cost acc. to requirments.

Composting :-

Def.

* It is the aerobic decomposition of organic matter under specific moisture & temp. Conditions for a specified period of time for optimum microbial growth.

** Factors required for successful process of Composting :- (14)

① The moisture Content: Should be 55% and maintained between 40-60% during Composting. Process may be inhibited if moisture falls below 40%.

② Carbon-Nitrogen Ratio (C:N) : * Should be between 25:1 and 40:1 (for typical o.M or manure)
* 10:1 to 20:1 for dead A's ...
* Wood Chips, Saw dust, peanut hulls, straw → Sour...

③ Aeration & oxygen :
* It Consumes large amount of O_2.
* aeration remove excess heat generated by m.o, gases within the material excess moisture.
* passive air change, forcing air through material or/and mechanical turning.

④ Temp. : (130°-140°)F

⑤ Time required : acc. to size of Carcass
* For smaller A's → 21-28 d. in each stage.
* For large A's → 60-90 d. " " "
* In each Case, a curing period of about 90 d. is needed after Complete Composting.

⇓

20 - 30 Cm
20 - 25 cm
10 - 15 Cm
20 - 25 Cm
20 - 30 Cm

** Environmental impact of A` manure :-

① Pollution of ground water by nitrates & Suf. water with phosphorus (Causing eutrophication).

- Eutrophication: ↑ pH in water due to pollution with A` manure.

② Pollution of Soil with heavy metals.

③ Manure may be Containing drug residue such as antibiotics.

④ The most important aerial pollutants are odors, gases, dust, micro-organisms & endotoxins which emitted during manure storage → Soil acidification (ammonia) and global warming (Methane & Nitrous oxide) about 20% of global methane production.

(15)

** Epidemiological impact of A` manure :- →

① The health of farmers working in Animal houses may be harmed by regular exposure to air pollutants.

② There are indoor health effects on man & livestock by bioaerosols.

. Thermal technologies for Hygienic disposal of A` manure

* using of heat to produce energy from manure is a thermo-Chemical process.

(16)

* These processes are Pyrolysis, Gasification, Combustion
  Convert A` manure into fuel

* " " differ with respect to temp. & O_2 Conc. but each Converts solid material into Combustible gaseous Components which then Create a hot flue gas.

* Flu gas directed through heat exchanger where heat is Captured & moved through a distribution system for use in poultry house.

Pyrolysis	Gasification	Combustion
700 - 1200 °F	1000 - 1800 °F	> 2000 °F
No oxygen	Limited oxygen	Controlled oxygen

(17) Intensive Marine aquaculture systems:-

Semi-closed (intensive):-

(1) Marine & tank system:

* Constructed on Coastal lands.
* used for intensive culture saline water → pumped onto the farm → gravity fed to a series of production ponds
* water drains from the ponds & enter a TTT pond where solid waste settle before water is discharged back to the sea.
* pond depth : 1.5-2 m.

(2) Fish Hatchery:

hatcheries produce larval, juvenile fish & shellfish → transfer to aquaculture facilities → (on grow) harvest size

* Should be highly flexible.

(18) Strategies to prevent monitor & Control fish diseases should be geared toward:

1- Develop regulation & a national plan to control & prevent distribution of fish dis.
2- Monitor pesticide residues in the water used for aquaculture.
3- Periodical analysis of feed samples.
4- Genetic Selection program to produce resistant strains.
5- laboratories near to farm areas.
6- Isolation & Identification of viruses, bact....
7- Determine effective TTT for each case.
8- Improve veterinarian service delivery for diagnosis & TTT of fish diseases.